Runoff Control and Conveyance Measures

Storm water runoff is rainfall or snowmelt that runs off the ground or impervious surfaces (buildings, roads, parking lots, etc.) and drains into natural or manmade drainage ways. In some cases, it drains directly into streams, rivers, lakes, sounds or the ocean. In other cases, particularly urbanized areas, it drains into streets and manmade drainage systems consisting of inlets and underground pipes commonly referred to as "storm sewers." Storm water entering storm sewers does not usually receive any treatment before it enters streams, lakes and other surface waters.

Storm water runoff problems and impacts are most evident in areas where urbanization has occurred. Changes in land use have a major effect on both the quantity and quality of Storm water runoff. Urbanization, if not properly planned and managed, can dramatically alter the natural hydrology of an area. Increased impervious cover decreases the amount of rainwater that can naturally infiltrate into the soil and increases the volume and rate of storm water runoff. These changes lead to more frequent and severe flooding and potential damage to public and private property. Under natural conditions, typically 10% of rainwater falling on a piece of property runs off the land surface into streams, rivers or lakes. The remainder either evaporates into the air or infiltrates into the soil replenishing groundwater supplies. Development of the site increases the percentage of impervious surfaces. As the percentage of impervious surfaces increases, the percentage of runoff increases since there is less vegetated area to soak up the rainwater.

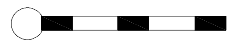
The rate of runoff and streamflow after a storm event also shows dramatic increases under post versus predevelopment conditions. The higher and more rapid peak discharge of runoff and streamflow can overload the capacity of the stream or river, causing downstream flooding and streambank erosion. Local governments spend millions of dollars each year rectifying damage to public and private property caused by uncontrolled storm water runoff. In heavily developed areas, damage to public and private property occurs during heavy rains. This damage includes road, culvert, and water and sewer line washouts, flooded homes and yards, the deposition of sediment and debris on properties and roads, and damage to bridges. When streambanks erode they clog stream channels, culverts, and pipes with sediment contributing to flooding problems. Sediment is washed into ponds, lakes, and other impoundments reducing their capacity to store water and requiring costly removal efforts. The increased volume and velocity of runoff and streamflow can also cause accelerated channel erosion and changes in streambed composition. This can destroy fish habitat and disrupt the natural ecology of the stream or river.

The following runoff control BMPs are discussed in this handbook:

- Pipe Slope Drains
- Runoff Diversion Measures
- Level Spreader
- Temporary Stream Crossing
- Subsurface Drains
- Construction De-watering

Pipe Slope Drains

Plan Symbol



Description

Pipe slope drains reduce the risk of erosion by discharging concentrated runoff from the top to the bottom of slopes. Pipe slope drains is temporary or permanent depending on installation and material used.

When and Where to Use It

Use pipe slope drains when it is necessary for water to flow down a slope without causing erosion, especially before a slope has been stabilized or before permanent drainage structures are installed. Install temporary pipe slope drains prior to construction of permanent drainage structures. Bury permanent slope drains beneath the ground surface. Stabilize the inlets and outlets of pipe slope drains with flared end sections, Erosion Control Blankets (ECBs), Turf Reinforcement Mats (TRMs) or riprap. Fully compact the soil around the pipe entrance to prevent bypassing and undercutting of the structure. Stabilize the discharge end of the pipe and along the bottom of any swales that lead to sediment trapping structures.

General Design Requirements

Typical pipe slope drains are made of non-perforated corrugated plastic pipe and are designed to pass the peak flow rates for the 10-year 24-hour storm event.

The maximum drainage area per pipe is two acres.

Installation

Secure and fasten slope drain sections together with gasket watertight fittings. Securely anchor slope drains to the soil with wooden stakes or steel posts.

Direct runoff to slope drains with diversion berms, swales, or dikes. The minimum depth of these dikes or berms should be 1.5-feet. The height of the berm around the pipe inlet should be a minimum of 1.5-feet high and at least 0.5-feet higher than the top of the pipe. The berm at the pipe inlet shall be compacted around the pipe. The area around the inlet shall be properly stabilized with ECBs, TRMs, riprap or other applicable stabilization techniques.

The area below the outlet must be properly stabilized with ECBs, TRMs, riprap or other applicable stabilization techniques.

If the pipe slope drain is conveying sediment-laden water, direct all flows into the sediment trapping facility.

Permanent slope drains should be buried beneath the soil surface at minimum depth of 1.5-feet.

Inspection and Maintenance

- Inspect pipe slope drain inlet and outlet points every 7 calendar days and within 24-hours after each rainfall event that produces ½-inches or more of precipitation.
- Inspect the inlet for undercutting, and water bypassing the point of entry. If there are problems, reinforce the headwall with compacted earth or sandbags.

- Inspect the outlet point for erosion and appropriate outlet protection.
- Remove temporary pipe slope drains within 30 days after final site stabilization is achieved or after the temporary BMP is no longer needed.
- Permanently stabilize disturbed soil areas resulting from slope drain removal.


Pipe Slope Drain

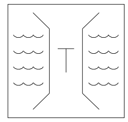

Pipe Slope Drain

Preventive Measures and Troubleshooting Guide

Field Condition	Common Solutions
Pipe separates.	Reconnect pipe sections. Securely anchor and stabilize pipe into soil. Ensure that pipe connections are watertight.
Pipe outlet erodes.	Repair the damage and stabilize outlet with a flared end section, riprap, TRM or velocity dissipation device. If necessary, reduce flows being discharged.
Pipe becomes clogged.	Flush out pipe. Place a screen or grate at inlet to capture trash and large particles.
Erosion occurs around inlet.	Compact soil and stabilize area with flared end section, TRM or filter fabric and riprap. Re-grade around inlet to reduce the gradient angle.
Excessive sediment accumulates around inlet/outlet.	Remove accumulated sediment and stabilize upstream area.
Slope drain overtops.	Limit drainage area and flow velocity. Check pipe diameter to ensure that it is sized properly to accept flow. Add additional pipes to carry flows as necessary.

Temporary Stream Crossing

Plan Symbol



Description

A temporary stream crossing is a bridge or culvert across a stream or watercourse for short-term use by construction vehicles and heavy equipment. A stream crossing provides a means for construction vehicles to cross streams or watercourses without moving sediment to streams, damaging the stream bed or channel, or causing flooding. Prior to constructing a temporary stream crossing, the owner/person financially responsible for the project must submit an Application for Permit to construct across or along a stream to South Carolina Department of Health and Environmental Control (SCDHEC). Temporary stream crossings require authorization. Refer to the US Army Corps of Engineers and SCDHEC nationwide 401 and 404 regulations for information on permitting requirements.

When and Where to Use It

When feasible, attempt to minimize or eliminate the need to cross streams. Temporary stream crossings are a direct source of pollution; therefore, every effort should be made to use an alternate method (e.g., longer detour), when feasible. When it becomes necessary to cross a stream, a well-planned approach minimizes damage to streambanks and reduces erosion. The design of temporary stream crossings requires knowledge of the design flows.

Temporary Bridge Crossing Design Criteria

- Structures are designed in various configurations. Select construction materials capable of withstanding the anticipated heavy loading of the construction traffic.
- Crossing Alignment. Design temporary waterway crossing at right angles to the stream. Where approach conditions dictate, the crossing may vary 15^{o} from a line drawn perpendicular to the centerline of the stream at the intended crossing location.
- Design a water diverting structure such as a dike or swale across the roadway on both roadway approaches 50-feet (maximum) on either side of the waterway crossing. This prevents roadway surface runoff from directly entering the waterway. Measure the 50-feet from the top of the waterway bank. Direct the flow captured in these dikes and swales to a sediment trapping structure. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is not required.
- Design appropriate perimeter controls such as silt fences, along stream banks.
- Design crossings with one traffic lane with a minimum width of 12-feet and a maximum width of 20-feet.

Temporary Culvert Crossing Design Criteria

- Limit the width of fill to that only necessary for the actual crossing.
- Use coarse aggregate of clean shot limestone rock and riprap with a 6-inch D_{50} or greater.
- Use clean shot rock and/or riprap as fill for crossings that will be in place for 6 to 12 months. Install a concrete cap over the rock for crossings that will be in place for more than 12 months.

- Design the stone cover over the culvert equal to ½ the diameter of the culvert or 12-inches, whichever is greater, but no greater than 18-inches.
- Design the culvert crossing to convey the flow from a two-year frequency storm without appreciably altering the stream flow characteristics.
- Place the maximum possible number of pipes within the streambanks with a maximum spacing of <u>12-inches</u> between pipes.
- The minimum-sized pipe culvert used is <u>24-inches</u>.
- Design culverts strong enough to support their cross-sectional area under the maximum expected heavy equipment loads.
- Design an adequate culvert length to extend the full width of the crossing, including side slopes.
- Design the minimum culvert slope to 3-inches per foot.
- <u>Crossing Alignment</u>. Design temporary culvert crossing at right angles to the stream. Where approach conditions dictate, the crossing may vary 15^{o} from a line drawn perpendicular to the centerline of the stream at the intended crossing location.
- Design approaches to meet the following specifications:
  1. Clean stone or concrete fill only
  2. Minimum thickness: 6-inches
  3. Minimum width: equal to the width of the structure
  4. 20-feet minimum approach length
- Design a water diverting structure such as a dike or swale across the roadway on both roadway approaches 50-feet (maximum) on either side of the waterway crossing. This prevents roadway surface runoff from directly entering the waterway. Measure the 50-feet from the top of the waterway bank. Direct the flow captured in these dikes and swales to a sediment trapping structure. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is not required.
- The maximum design life of temporary culvert crossings is 24 months.

Installation

Install crossings prior to any other activities. Install and maintain pump-around diversions prior to any excavation and during the installation of the crossing. Place crossings in temporary construction easements only.

Minimize streambank clearing. Do not excavate rock bottom streambeds to install the crossing. Lay the culvert pipes on the streambed "as is" when applicable. Place as many pipes as possible within the low area of the stream. Place remaining pipes required to cross the stream on the existing stream bottom.

Install pipes with a maximum spacing of 12-inches between pipes. The minimum sized pipe culvert that may be used is <u>24-inches</u>.

Install culverts with a length that extend the full width of the crossing, including side slopes.

Use coarse aggregate of clean limestone riprap with a 6-inch D_{50} or greater to form the crossing. Install the stone cover over the culvert equal to ½ the diameter of the culvert or 12-inches, whichever is greater, but no greater than 18-inches.

Limit all fill materials associated with the roadway approach to a maximum height of 2-feet above the existing flood plain elevation.

Inspection and Maintenance

- Inspect crossings every 7 calendar days and within 24-hours after each rainfall event that produces ½-inches or more of precipitation. Check the structure integrity and for excessive sediment deposition and replace fill stone as needed.
- Clean mud and/or sediment from the roadway and prevent it from entering the stream.
- The structure shall be removed when it is no longer required to provide access to the construction area. During removal, leave stone and geotextile fabric for approaches in place. Place fill over the approaches as part of the streambank restoration operation. A temporary culvert crossing should be in place no longer than 24 months.

Temporary Stream Crossing

Temporary Stream Crossing

Preventive Measures and Troubleshooting Guide

Field Condition	Common Solutions
Slopes of temporary earthen crossing erodes.	Place rock layer on slope sides. Stabilize roadway at crossing.
Sediment and debris block culvert inlet.	Remove sediment and debris as necessary to keep pipe open.
Pipe outlet causes erosion.	Stabilize outlet with riprap or flared end section.
Overtopping occurs.	Incorrect design. Redesign crossing and obtain approval (stamp) of registered civil and/or structural engineer.

Runoff Diversion Measures (Diversion Berms/Dikes and Swales)

Plan Symbol

→DD→DB→

Description

Diversion dikes and berms (ridges of compacted soil) and diversion swales (excavated depressions) are used to divert upslope runoff from crossing areas where there is a high risk of erosion. Use runoff conveyance structures as temporary clean water diversions, temporary sediment laden diversions, or permanent clean water diversions. Use runoff control measures as either temporary or permanent storm water control structures.

When and Where to Use It

Runoff conveyance measures are installed around the perimeter of a construction sites before major disturbing activities takes place. When constructed along the upslope perimeter of a disturbed or high-risk area (though not necessarily all the way around it), clean water diversions prevent clear water runoff from flowing over unprotected down slope areas. Sediment laden diversions located on the downslope side of a disturbed or high-risk area prevent sediment-laden runoff from leaving the site before sediment is properly removed. For short slopes, runoff control measures at the top of the slope reduce the amount of runoff reaching the disturbed area. For longer slopes, several dikes or swales are placed across the slope at intervals. This practice reduces the amount of runoff that accumulates on the face of the slope and carries the runoff safely down the slope. In all cases, runoff is guided to sediment trapping area or a stabilized outfall before release.

General Design Requirements

Runoff conveyance measures are used in areas of overland flow. Direct runoff channeled by diversion dikes or swales to an adequate sediment trapping structure or stabilized outfall. Provide enough channel slope for drainage but not too much slope to cause erosion due to high runoff flow velocities. Temporary runoff control measures may remain in place as long as 12 to 18 months (with proper stabilization). Diversion dikes or swales remain in place until the area they were built to protect is permanently stabilized. Design permanent controls to handle runoff after construction is complete. Permanent controls should be permanently stabilized, and should be inspected and maintained on a regular basis.

Diversion Dike and Berm General Design Requirements

- Top Width. 2 foot minimum.
- Height of Dike or Berm 1.5 foot minimum measured from upslope toe.
- Side Slopes. 2H:1V or flatter.
- Grade. Limit grades between 0.5 percent and 1.0 percent.
- Stabilization. Stabilize slopes immediately using vegetation, sod, and erosion control blankets or turf reinforcement mats to prevent erosion.
- Outlet. Provide positive drainage to the upslope side of the dike so no erosion occurs at the outlet. Provide energy dissipation measures as necessary. Discharge sediment-laden runoff through a sediment trapping facility.
- Other. Minimize construction traffic over diversion dikes and berms.

Diversion Swale General Design Requirements

- Bottom Width. 2 foot minimum, with a level bottom.
- Depth. 1.5 foot minimum.
- Side Slope. 2H:1V or flatter.
- Grade. Maximum 5 percent, with positive drainage to a suitable outlet.
- Stabilization. Stabilize with erosion control blankets or turf reinforcement mats immediately.
- Outlet. Level spreader or riprap to stabilize outlet/sedimentation pond.

Installation

Stabilized using vegetation, sod, and ECBs or TRMs before any major land disturbing activity takes place.

Install the top width of diversion dikes at least 2-feet wide. Install the bottom width at ground level at least 8-feet wide.

The minimum height for earthen dikes is 18-inches, with side slopes no steeper than 2H:1V.

Minimize construction traffic over diversion dikes and berms. However, for points where vehicles must cross the dike, the slope should be no steeper than 3H:1V and the mound should be constructed of gravel rather than soil.

Prior to swale excavation or dike building, clear and grub all trees, brush, stumps, and other objects in the path of the diversion structure.

Ensure the minimum constructed cross section meets all dimensions shown on the plans.

Immediately after construction establish vegetation by placing an Erosion Control Blanket on the diversion dikes and silt ditches.

Provide positive drainage to the upslope side of the dike so no erosion occurs at the outlet. Provide energy dissipation measures as necessary. Discharge sediment-laden runoff through a sediment trapping facility.

Inspection and Maintenance

- The runoff control measure should be inspected, every 7 calendar days and within 24-hours after each rainfall event that produces ½-inches or more of precipitation and repairs made as necessary.
- Damage caused by construction traffic or other activity must be repaired before the end of each working day.

Diversion Berm

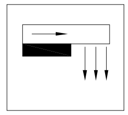
Diversion Berm

Preventive Measures and Troubleshooting Guide

Field Condition	Common Solutions
Dikes wash out.	Re-grade, compact, and stabilize the soil used to build earthen dikes.
Area behind dikes eroded.	Stabilize the area. Use other BMPs to stabilize the uphill side of the dike.
Concentrated flow causes erosion.	Stabilize area and use check dams, ECBs, TRMs or riprap to prevent erosion.
Ditches and swales erode due to high velocity flows.	Stabilize and use check dams, ECBs, TRMs or riprap to prevent erosion.
Swales and ditches fill up with sediment.	Remove accumulated sediment from ditches and swales. Stabilize upstream contributing areas with appropriate erosion prevention BMPs.
Ditches and swales are overtaken by flows.	Determine the upstream contributing areas and size ditches and swales to handle anticipated flow velocities.
Outlet erodes.	Re-grade and stabilize outlet with ECBs, TRMs or riprap.

Level Spreader

Plan Symbol



Description

A level spreader is a permanent outlet for dikes and diversions consisting of an excavated channel constructed at zero grade across a slope that converts concentrated runoff to sheet flow and releases it onto areas stabilized by existing vegetation. Sediment-laden waters **should not** be directed towards level spreaders.

When and Where to Use It

Construct level spreaders on undisturbed areas that are stabilized by existing vegetation and where concentrated flows are anticipated to occur. Diversion channels call for a stable outlet for concentrated storm water flows. The level spreader is used for this purpose if the runoff is relatively free of sediment. If properly constructed, level spreaders significantly reduce the velocity of concentrated storm water and spread it uniformly over a stable undisturbed area.

Design Criteria

Design the grade of the channel transition for the last 20-feet before entering the level spreader less than or equal to 1 percent. The crest of the overflow is level (0 percent grade) to ensure uniform spreading of runoff.

Design the lip of the level spreader with a Turf Reinforcement Mat (TRM) able to withstand 5-lbs./ft shear stress.

Determine the spreader dimensions by estimating the flow expected from the 10-year, 24-hour design storm (Q_{10}). The maximum flow into the spreader should not exceed 30 cfs.

- The minimum width of the spreader is 6-feet.
- Design a minimum uniform depth of 0.5-feet across the entire length the of the spreader as measured from the crest of the lip.
- The maximum design the slope of the undisturbed outlet is 10 percent.

Installation

Care must be taken during construction to ensure the lower lip of the structure is level.

If there are any depressions in the lip, flow will tend to concentrate at these points and erosion will occur, resulting in failure of the outlet. Avoid the problem by using a grade board, a gravel lip or a TRM along the exit lip of the level spreader.

Extend the TRM 10-feet below the lip and bury it at least 6- inches within the spreader, and extend at least 12-inches beyond the lip on the outside of the spreader.

Install the grade of the channel transition for the last 20-feet before entering the level spreader less than or equal to 1 percent.

Install the crest of the overflow level (0 percent grade) to ensure uniform spreading of runoff.

Inspection and Maintenance

- The spreader should be inspected every 7 days and within 24-hours after each rainfall event that produces ½-inches or more of precipitation to ensure that it is functioning correctly.
- The contractor should avoid the placement of any material on the structure or prevent construction traffic across the structure.
- If the spreader is damaged by construction traffic, it should be immediately repaired.

Level Spreader

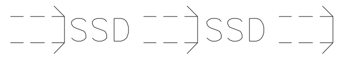
Level Spreader

Preventive Measures and Troubleshooting Guide

Field Condition	Common Solutions
Spreader is damaged by construction traffic.	Repair immediately.
Water is channelizing and causing erosion.	Make sure level spreader lip was installed correctly, with a 0% grade to ensure a uniform distribution of flow, Repair immediately, as needed.
Too much sediment has accumulated.	Remove accumulated sediment to recover capacity. A sediment forebay may need to be constructed at the inlet of the level spreader.

Subsurface Drains

Plan Symbol



Description

A subsurface drain is a perforated pipe or conduit placed beneath the surface of the ground at a designed depth and grade.

When and Where to Use It

Subsurface drains are used to do the following:

- Drain areas by intercepting and conveying groundwater.
- Lower the water table.
- Drain or de-water storm water detention structures.
- Prevent sloping soils from becoming excessively wet and subject to slippage.

There are two types of subsurface drains: relief drains and interceptor drains.

- Relief drains are used to de-water an area where the water table is high. They are placed in a gridiron, herringbone, or random pattern.
- Interceptor drains are used to remove water where soils are excessively wet or subject to slippage. They are usually placed as single pipes instead of patterns.

Subsurface drains are suitable only in areas where the soil is deep enough for proper installation. They are not recommended where they pass under heavy vehicle crossings.

General Design Criteria

- Size subsurface drains for the required flow capacity. The minimum diameter for subsurface drains is **4-inches.**
- The minimum velocity required to prevent silting is **1.4-feet/second**. Grade the line to achieve this velocity.
- Use filter material and/or fabric around all drains for proper bedding and filtration of fine materials. Place a minimum of 3-inches of material on all sides of the pipe.
- If free of sediment, design the outlet to discharge into a receiving channel, swale, or stable vegetated area adequately protected from erosion and undermining. Locate the outlet point above the mean water level of the receiving channel. The outlet consists of a 10-foot section of corrugated metal, cast iron, steel or schedule 40 PVC pipe without perforations.
- Acceptable materials for subsurface drains include perforated, continuous closed-joint conduits of corrugated plastic pipe meeting the requirements of AASHTO M252 for polyethylene tubing, AASHTO M278 Class PS 50 for polyvinyl requirements, or AASHTO A1 196 for Type III aluminum alloy pipe.
- Subsurface drains are not designed to flow under pressure and the hydraulic gradient is parallel with the grade line. The flow is considered to be open channel and Manning's Equations is used. The required subsurface drain size is determined from the following steps:
  - Determine the flow rate that the subsurface drain must carry.
  - Determine the gradient of the drain.
  - Determine the appropriate Manning's n value for the selected subsurface drain pipe.
  - Select the appropriate subsurface drain capacity chart.
  - Enter the gradient of the pipe and the design flow of the pipe.

Installation

Install relief drains through the center of wet areas that drain in the same direction of the slope.

Install interceptor drains on the up-slope side of wet areas and install them across the slope to drain to the side of the slope.

Locate subsurface drains in areas where there are no trees within 50-feet of the drain.

Construct the installation trench on a continuous grade with no reverse grades or low spots.

Stabilize soft or yielding soils under the drain with gravel or suitable material.

Do not use deformed, warped, or otherwise unsuitable pipe.

Place filter material at least 3-inches of material on all sides of pipe.

Backfill trenches after pipe placement with no pipe remaining uncovered overnight or during a rainstorm. Place backfill material in the trench so that the pipe is not displaced or damaged. Use highly permeable open granular soil for backfill.

The outlet should consist of a 10-foot section of corrugated metal, cast iron, steel or schedule 40 PVC pipe without perforations. At least two-thirds of outlet pipe should be buried.

The outlet consists of a 10-foot section of corrugated metal, cast iron, steel or schedule 40 PVC pipe without perforations.

Inspection and Maintenance

- Inspect subsurface drains on a regular schedule and check for evidence of pipe breaks or clogging by sediment, debris, or tree roots.
- Remove blockage immediately, replace any broken sections, and re-stabilize the surface. If the blockage is from tree roots, it may be necessary to relocate the drain.
- Check inlets and outlets for sediment or debris. Remove and dispose of these materials properly.
- Check the drainage line where heavy vehicles cross drains to ensure that pipes are not crushed or damaged.

Subsurface Drain

Subsurface Drain Pipe

Preventive Measures and Troubleshooting Guide

Field Condition	Common Solutions
Discharge or treated water causes erosion.	Install outlet protection or velocity dissipation device.
Treatment unit fills with sediment.	Remove sediment when unit reaches 1/3 its capacity to preserve settling efficiency.
Dewatering discharge flow is higher than expected.	Alter the treatment unit to handle increased flow.
Water spread on the construction site is not infiltrating fast enough and is entering the storm drain system or receiving water body.	Stop dewatering. Install a sediment treatment system and test discharge as necessary.

Construction De-Watering

Description

Construction de-watering involves removing storm water or ground water from bore pits, trenches, and other excavations on a construction site. Typically, this removal of water involves the pumping of the water to an appropriate receiving area. Direct pumping to lakes, rivers, and streams is illegal and must be avoided.

Design Criteria

Size the pump utilized for de-watering purposes properly. Each pump has its own unique rating curve, therefore it is not feasible to list them in this chapter. The pump rating curve is used to calculate pump design flows based on head loss through the pump system.

Pump sediment-laden groundwater directly to:

- A sediment control structure (sediment basin, sediment trap manufactured de-watering device)
- An infiltration trench
- A buffer strip or zone

Inspection and Maintenance

Pumping to a Sediment Control Structure:
It is recommended that sediment basins or temporary sediment traps receive sediment-laden water from bore pits and trenches. Ensure that the pumping of this water does not cause the sediment control structure to fail. In addition, ensure that erosion does not occur at the outlet of the hose from the pump due to high concentrated flows.

Pumping to an Infiltration Trench:
Ensure that erosion does not occur at the outlet of the hose from the pump due to high concentrated flows.

Pumping to a Vegetated Buffer Zone:
Ensure that erosion does not occur at the outlet of the hose from the pump due to high concentrated flows.

Construction Dewatering

Preventive Measures and Troubleshooting Guide

Field Condition	Common Solutions
Discharge or treated water causes erosion.	Install outlet protection or velocity dissipation device.
Treatment unit fills with sediment.	Remove sediment when unit reaches 1/3 its capacity to preserve settling efficiency.
Dewatering discharge flow is higher than expected.	Alter the treatment unit to handle increased flow.
Water spread on the construction site is not infiltrating fast enough and is entering the storm drain system or receiving water body.	Stop dewatering. Install a sediment treatment system and test discharge as necessary.